



RAPID THERMAL PROCESSOR IMPROVES DOMESTIC MANUFACTURING CAPABILITY FOR COCKPIT DISPLAY

32



Payoff

The rapid thermal processor system, shown above, will help establish a domestic manufacturing capability for active matrix liquid crystal displays used in flat panel cockpit displays. It will reduce display costs by 30 percent, while improving flat panel display resolution.

Accomplishment

Under a program sponsored by the Materials and Manufacturing Directorate, Intervac RTP Incorporated developed a production worthy, rapid thermal processor (RTP) that enabled, for the first time, glass substrates to be heated to temperatures above their strain (working) temperatures with little or no warpage. This first generation rapid thermal processing system for manufacturing active matrix liquid crystal displays (AMLCDs) uses a selected spectrum energy source capable of selectively heating the thin films of interest to a very high temperature, while leaving the bulk temperature of the underlying substrate materials substantially below their strain point.

Background

AMLCD technology is needed for cockpit flat panel displays so they can be viewed in bright sunlight with full-color and high definition images. The thin film transistors (TFTs) are the key electronic components on flat panel displays (they act like on/off switches). Use of polysilicon in these displays allows designers to incorporate the superior qualities of the polysilicon film in the manufacture of TFTs. The crystalline grain structure of polysilicon increases electronic transport allowing creation of improved quality TFTs. The RTP is a solid state conversion process that uses lamps to take amorphous silicon through a liquid recrystallization phase conversion. The working prototype large area rapid thermal processor is capable of (1) recrystallizing amorphous thin films, (2) implant activation, and (3) aluminum alloying on quartz glass and low cost substrate glass. The resulting system is the first to selectively heat the thin films of interest to very high temperature, enhancing their electrical properties, while leaving the bulk temperature of the substrate material substantially below its strain point. The RTP system was developed in support of DARPA's High Definition Systems Initiative, which focuses on developing the equipment, processes and materials necessary to build a strong manufacturing display infrastructure.